

Claims

- [c1] A method of reliability testing comprising:
 providing a test structure;
 determining a critical breakdown resistance of the test structure, wherein the critical breakdown resistance of the test structure causes a circuit to fail;
 subjecting the test structure to stress conditions;
 repetitively determining an operating resistance of the test structure; and
 recording a critical breakdown time when the operating resistance of the test structure is equal or smaller than the critical breakdown resistance.
- [c2] The method of claim 1 wherein the test structure comprises a substrate and a dielectric layer formed thereon.
- [c3] The method of claim 2 wherein the dielectric layer comprises an oxide layer.
- [c4] The method of claim 2 wherein the test structure comprises the actual device.
- [c5] The method of claim 4 wherein the test structure comprises a transistor or capacitor.
- [c6] The method of claim 2 wherein the test structure comprises a capacitor structure.
- [c7] The method of claim 1 wherein the stress conditions comprise elevated voltages.
- [c8] The method of claim 7 wherein an elevated voltage is about twice an operating voltage.
- [c9] The method of claim 7 wherein the stress conditions comprise elevated temperatures or currents.
- [c10] The method of claim 1 wherein the step of determining the critical breakdown resistance comprises determining the critical breakdown resistance in a circuit environment under normal operating conditions.
- [c11] The method of claim 10 wherein the step of determining the critical breakdown

resistance of the test structure comprises a circuit simulation.

- [c12] The method of claim 1 wherein the step of determining the critical breakdown resistance of the test structure comprises a circuit simulation.
- [c13] The method of claim 12 wherein the step of repetitively determining the operating resistance comprises determining the operating resistance after a significant change is detected in at least one electrical property.
- [c14] The method of claim 13 wherein the electrical property comprises current or voltage.
- [c15] The method of claim 13 further comprises repetitively determining the operating resistance after a time interval.
- [c16] The method of claim 15 wherein the time interval is predefined according to a stress duration.
- [c17] The method of claim 16 further comprising determining a maximum current after breakdown.
- [c18] The method of claim 1 wherein the step of repetitively determining the operating resistance comprises repetitively determining the operating resistance after a significant change is detected in at least one electrical property.
- [c19] The method of claim 18 wherein the electrical property comprises current or voltage.
- [c20] The method of claim 19 further comprises repetitively determining the operating resistance after a time interval.
- [c21] The method of claim 1 wherein the step of repetitively determining the operating resistance comprises repetitively determining the operating resistance after a time interval.
- [c22] The method of claim 21 wherein the time interval is predefined according to a stress duration.
- [c23] The method of claim 21 further comprising determining a maximum current

after breakdown.

- [c24] The method of claim 1 further comprising determining a maximum current after breakdown.
- [c25] The method of claim 1 further comprising computing a reliability of the test structure from the critical breakdown time.
- [c26] The method of claim 25 wherein the step of determining the critical breakdown resistance comprises determining the critical breakdown resistance in a circuit environment under normal operating conditions.
- [c27] The method of claim 26 wherein the step of determining the critical breakdown resistance of the test structure comprises a circuit simulation.
- [c28] The method of claim 27 wherein the step of repetitively determining the operating resistance comprises repetitively determining the operating resistance after a significant change is detected in at least one electrical property.
- [c29] The method of claim 28 wherein the electrical property comprises current or voltage.
- [c30] The method of claim 28 further comprises repetitively determining the operating resistance after a time interval.